

California on the 18th and 19th. After these rains had ceased the North Pacific HIGH resumed more nearly its normal position off the California coast.

One small-craft and four storm warnings were issued for one or more sections, and 12 frost warnings were sent to North Pacific stations, most of which were verified.—*E. A. Beals.*

RIVERS AND FLOODS.

By H. C. FRANKENFIELD, Meteorologist.

At the close of the month of May the Mississippi River was still in flood from Natchez, Miss., to the mouth of the river, and the Yazoo and Atchafalaya Rivers also remained in flood. A summary of the lower Mississippi floods will appear in the MONTHLY WEATHER REVIEW for June, 1922.

Aside from the lower Mississippi flood there were no floods of consequence during the month except in the rivers of Texas and in the Colorado River, the latter continuing at the close of the month. The annual rise of the Columbia River was also in progress.

The Santee River has been in flood since February 3, 1922, and remained so at the end of the month. Other rivers of the Carolinas were in moderate flood at different times during the month of May. Warnings were issued when necessary, and no damage was done, as previous rains had delayed planting and live stock had been removed from the lowlands.

The flood in the lower Tombigbee River of Alabama was of similar character, and moderate floods in the interior rivers of Ohio were without special incident.

The Illinois River fell steadily, but was still generally in flood at the end of the month.

The floods in the Red and Sulphur Rivers, while not severe, caused considerable apprehension. These floods began directly after the heavy rainfalls of April 26 and 27, and flood warnings were immediately issued.

Damage amounted to about \$15,500, and property to an estimated value of \$5,000 was reported as having been saved by the flood warnings. There was, however, considerable further delay in the cultivation of crops on lowlands that remained under water from previous floods.

The floods in most of the rivers of Texas were severe, and in some instances were the highest of record. The ground had become well saturated from the heavy rains of the latter part of April, and the streams were already much above their normal stage. Consequently, the additional heavy rains of the first decade of May caused floods that were certain to prove destructive despite the frequent warnings that were issued.

The Neches River flood again covered the lowlands for a distance of about 6 miles on the left side of the river, with additional damage amounting to about \$10,800. Value of property saved through the warnings, \$1,000. The highest stage reported was 27.5 feet at Rockland, Tex., on May 5, flood stage being at 20 feet. The highest stage in the Sabine River at Logansport, La., was 31 feet

on May 1, 7 feet above the flood stage. Losses, \$105,000. Value of property saved through warnings, \$170,000.

There were two floods in the Trinity River, one continuing from April and the other beginning after the heavy rains of May 8 and 9. The crest stage reached at Liberty, Tex., was 28.6 feet, 3.6 feet above the flood stage and 0.2 foot above the previous high-water record of January 31, 1920.

Losses and damage were of the usual character and amounted to about \$308,000, and the value of property saved through the warnings, \$67,500.

The Brazos River flood was the most destructive of all, with a crest stage at Kopperl, Tex., of 48 feet, 27 feet above the flood stage and 11.5 feet above the previous high-water record of November 8, 1918. Below Kopperl stages were relatively more moderate, but the damage and losses amounted to about \$1,742,700, of which about two-thirds was in prospective crops. Estimated value of property saved through warnings, \$415,500.

The Guadalupe River was in flood during the early days of the month. Crest stages were 30.3 feet on May 5 at Gonzales, 8.3 feet above the flood stage, and 23.2 feet on May 9 at Victoria, 7.2 feet above flood stage. Warnings were issued as required, and the losses were small.

The Colorado River flood was severe and the losses amounted to about \$800,000, of which \$700,000 were in potatoes alone, 15,000 acres having been ruined. Crest stages were from 4 to 10 feet above flood stage, and several levees gave way. Bridges were damaged and railroad tracks washed out. Maj. F. D. Lockland, viewing the river from an elevation of 7,000 feet, said, "We saw the river in Wharton County 10 miles wide, a winding, silvery expanse of flood drifting to the sea, and spreading out over the prairie so as to make it impossible to follow the bed of the river." Warnings were timely and accurate.

Floods in the Colorado River of Colorado, Utah, Arizona, and California.—Temperatures were generally above normal during the first decade of the month, and the water from the melting snows caused a sharp rise in the upper Colorado River and its tributaries. Warnings were first issued on May 4 for the lower Colorado and repeated thereafter as occasion required. Warnings were also issued for the upper portion of the drainage basin, beginning with May 6. On May 12 a crevasse occurred in levee on the right bank of the river at Hauser Bend, in the Palo Verde Valley, near Ripley, Calif., and it has been reported that the crevasse finally attained a width of 1,300 feet, carrying most of the river discharge at that point, and returning to the river at the south end. The total area of the Palo Verde Valley is about 90,000 acres. Thirty thousand acres were inundated, of which 10,000 are under cultivation and include the towns of Ripley, Palo Verde, and Rannels. There was no loss of life, but the damage amounted to probably \$1,000,000. The crest of the levee was 9 feet above the water when the crevasse occurred.

There were also some floods in the San Joaquin River of California and tributaries, and press reports state that much damage was done to growing crops. Some of these floods were in progress at the end of the month, and effort will be made to secure further information.

Flood stages during May, 1922.

River and station.	Flood stage.	Above flood stages—dates.		Crest.		River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.			From—	To—	Stage.	Date.
ATLANTIC DRAINAGE.							Feet.				Feet.
Roanoke:						Red:					
Weldon, N. C.....	30	20	21	34.3	21	Fulton, Ark.....	28	(1)	2	28.4	2
Neuse:						Alexandria, La.....	28	15	16	28.4	16
Neuse, N. C.....	14	19	19	14.7	19		36	5	25	37.4	10
Smithfield, N. C.....	14	20	22	15.0	21	Ouachita:					
Saluda:						Camden, Ark.....	30	(1)	4	32.4	2
Pelzer, S. C.....	7	5	6	10.0	5	Monroe, La.....	40	(1)	29	42.3	9-11
Chappells, S. C.....	7	17	17	8.0	17	Atchafalaya:					
Santee:						Simmesport, La.....	41	(1)	(2)	51.9	16
Rimini, S. C.....	12	(1)	14	13.6	10	Melville, La.....	37	(1)	(2)	45.9	14-16
Ferguson, S. C.....	12	(1)	(2)	14.7	23	WEST GULF DRAINAGE.					
	12	(1)	(2)	13.5	24	Sabine:					
EAST GULF DRAINAGE.						Logansport, La.....	24	(1)	21	31.0	1
Apalachicola:						Bon Wier, Tex.....	24	23	26	24.4	23-25
River Junction, Fla.....	12	7	8	12.3	8		20	5	17	20.9	10-12
Blountstown, Fla.....	15	8	9	15.2	8	Neches:					
	15	31	(2)	15.5	31	Rockland, Tex.....	20	(1)	14	27.5	5
Tombigbee:						Beaumont, Tex.....	7	8	17	9.5	11
Demopolis, Ala.....	39	6	12	42.6	9	Trinity:					
GREAT LAKES DRAINAGE.						Fort Worth, Tex.....	30	9	9	35.1	9
Sandusky:						Dallas, Tex.....	23	(1)	5	32.9	1
Upper Sandusky, Ohio.....	13	21	21	13.0	21		25	9	15	41.7	9
MISSISSIPPI DRAINAGE.						Trinidad, Tex.....	28	(1)	22	39.9	15
Walhonding:						Long Lake, Tex.....	40	(1)	10	43.3	2
Walhonding, Ohio.....	8	20	20	9.0	20		40	14	23	42.0	18
Scioto:						Riverside, Tex.....	40	3	15	46.2	4
La Rue, Ohio.....	11	20	21	12.0	20		40	25	28	40.2	25
Circleville, Ohio.....	11	27	27	12.0	27	Liberty, Tex.....	25	(1)	(2)	28.6	8-11
Ohio:						Brazos:					
Shawneetown, Ill.....	35	(1)	1	35.2	1	Kopperl, Tex.....	21	9	11	48.0	9
Cairo, Ill.....	45	(1)	7	50.9	1	Waco, Tex.....	27	10	11	36.4	10
Des Moines:							27	15	15	27.5	15
Ottumwa, Iowa.....	10	27	27	10.0	27	Valley Junction, Tex.....	44	2	6	47.0	3
Illinois:						Washington, Tex.....	45	(1)	15	50.9	5
Henry, Ill.....	7	(1)	(2)	12.9	1	Hempstead, Tex.....	40	2	11	43.6	6
Peru, Ill.....	14	(1)	12	17.4	1	Rosenberg, Tex.....	40	14	15	40.7	15
Havana, Ill.....	14	27	(2)	15.0	28	Freeport, Tex.....	43	5	14	49.8	9
Beardstown, Ill.....	14	(1)	19	19.9	1		4	1	1	4.2	1
Pearl, Ill.....	12	(1)	22	20.8	1		4	10	15	4.7	13
James:						Colorado:					
Huron, S. Dak.....	9	(1)	8	10.0	1	Austin, Tex.....	18	(1)	4	23.0	2
	9	12	29	11.4	10-21	Columbus, Tex.....	28	(1)	10	38.2	4-5
Osage:						Smithville, Tex.....	28	21	22	29.0	21
Tusculum, Mo.....	25	(1)	1	25.9	1		24	(1)	6	28.2	3
St. Francis:						Guadalupe:					
Marked Tree, Ark.....	17	(1)	3	17.2	1	Gonzales, Tex.....	22	4	5	30.3	4
Yazoo:						Victoria, Tex.....	16	(1)	9	23.2	8
Yazoo City, Miss.....	25	(1)	(2)	31.9	1, 4-6	Rio Grande:					
Tallahatchie:						Rio Grande City, Tex.....	15	2	2	19.5	2
Swan Lake, Miss.....	25	3	29	27.7	13-17	COLORADO DRAINAGE.					
Petit Jean:						Engle:					
Danville, Ark.....	20	5	6	21.0	5	Engle, Colo.....	5	29	29	5.0	29
Black:						Gunnison:					
Black Rock, Ark.....	14	(1)	8	15.7	1-2	Sapinero, Colo.....	16	6	8	17.0	7
Mississippi:							16	24	(2)	17.6	28
Keokuk, Iowa.....	14	(1)	3	14.8	1	Delta, Colo.....	9	7	8	9.1	7
Warsaw, Ill.....	17	(1)	2	17.5	1	North Fork of Gunnison:					
Quincy, Ill.....	14	(1)	5	16.4	1	Paonia, Colo.....	8	(1)	(2)	9.5	30
Hannibal, Mo.....	13	(1)	8	16.8	1	Green:					
Louisiana, Mo.....	12	(1)	8	15.4	1	Elgin, Utah.....	13	28	(2)	13.3	31
Grafton, Ill.....	18	(1)	9	22.7	1	Colorado:					
Chester, Ill.....	27	(1)	3	27.9	1	Fruita, Colo.....	12	27	(2)	12.3	29
Cape Girardeau, Mo.....	30	(1)	5	33.3	1	Lees Ferry, Ariz.....	12	(1)	(2)	22.3	31
New Madrid, Mo.....	34	(1)	9	40.7	1		14	8	8	14.1	8
Memphis, Tenn.....	35	(1)	13	42.2	1	Topock, Ariz.....	14	10	15	16.8	13
Helena, Ark.....	42	(1)	18	53.1	3		14	26	(2)	18.5	31
Arkansas City, Ark.....	48	(1)	23	57.7	3-5	Parker, Ariz.....	7	5	(2)	10.3	31
Greenville, Miss.....	42	(1)	22	52.0	3-4	PACIFIC DRAINAGE.					
Vicksburg, Miss.....	45	(1)	30	54.7	1-9	Kings:					
Natchez, Miss.....	46	(1)	(2)	52.8	9-12	Piedra, Calif.....	12	6	8	12.7	7
Baton Rouge, La.....	35	(1)	(2)	45.7	16		12	18	19	12.7	19
Donaldsonville, La.....	28	(1)	(2)	35.9	16		12	23	(2)	13.4	31
New Orleans, La.....	18	(1)	(2)	21.3	1	Columbia:					
Cypress:						Marcus, Wash.....	24	31	(2)	24.0	31
Jefferson, Tex.....	18	(1)	5	20.1	2-3	Vancouver, Wash.....	15	21	(2)	18.1	30-31
Sulphur:						Clearwater:					
Finley, Tex.....	24	(1)	6	27.4	1	Kamiah, Idaho.....	14	19	19	14.2	19
	24	15	18	25.0	15-16	Willamette:					
	20	(1)	2	21.3	1	Portland, Oreg.....	15	21	(2)	17.4	30-31
Ringo Crossing, Tex.....	20	10	13	24.4	11	Continued from April, 1922.					
						Continued into June, 1922.					